Cerebral Vascular Occlusion

Angiographic Diagnosis

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• **Cerebral arterial occlusion is a fairly frequent condition. We have diagnosed nine cases by cerebroangiography in the past two years, and there are many patients not given this special examination.**

Precise diagnosis has become more important as advances in therapy make prognosis more hopeful. The symptoms are various according to the location and degree of occlusion and the amount of collateral circulation.

Angiographic diagnosis is not difficult, but repeated demonstration of the block should be insisted on. This is best done with multiple exposures after a single injection of contrast medium. We use 7 cc. of 50 per cent Hypaque® and one exposure per second through the arterial, capillary and venous phases. The films should cover the entire head and neck lest an occlusion in the common carotid be overlooked. We have found the Schonander biplane apparatus very satisfactory, using films 14 inches square and exposing them in anteroposterior and lateral projections simultaneously.

WITH THE INTRODUCTION of cerebral angiography by Egaz Moniz the vessels of the brain were shown *in vivo* for the first time.[2] The many syndromes associated with vascular occlusion are now being delineated.[1,4]

Many studies have been done using single radiographic exposures after the injection of contrast media into the carotid or vertebral arteries.[3] This procedure will often demonstrate occlusions but occasionally is inconclusive because of the difficulty in timing the exposure. Also, contrast media do not mix intimately with the blood but tend to layer, giving a false impression of narrowing.

We have been struck by the number of false impressions obtained if only one of a series of films is examined. We believe that films should be taken at least one a second in each plane during the entire arterial, capillary and venous phases. It is preferable to take them biplane with simultaneous exposures. The films should be large enough to include the areas of possible stenosis from the common carotid artery to the terminal cerebral arteries.

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Submitted November 13, 1958.

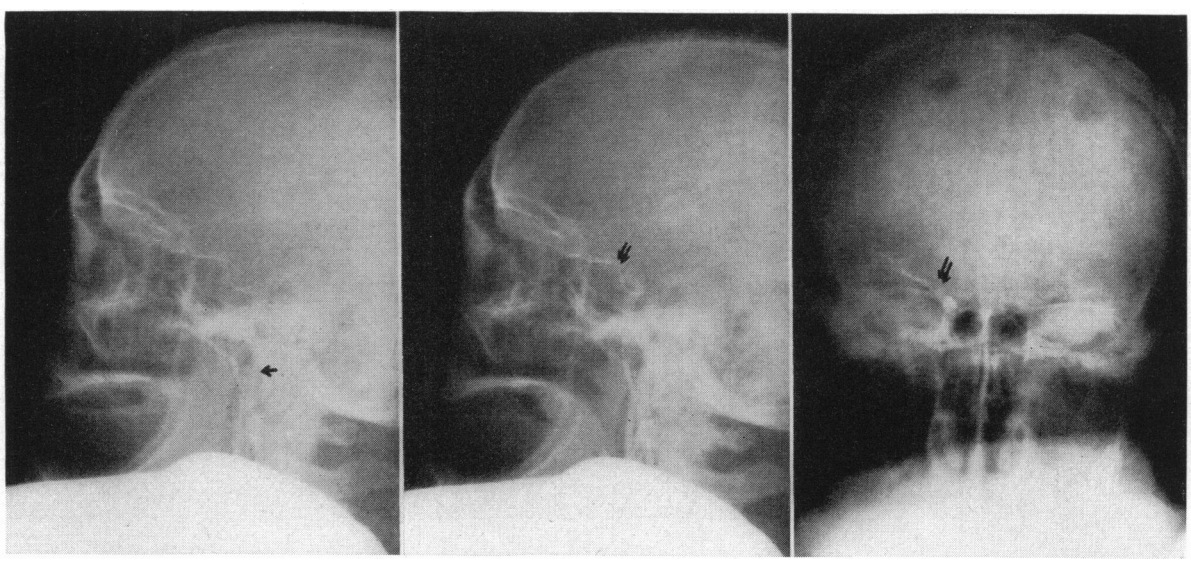

Figure 1 (Case 1).—*Left:* Lateral projection two seconds after start of injection, giving false impression of narrowing of internal carotid artery (arrow). *Center and right:* Lateral and anteroposterior projections, four seconds after start of injection, demonstrating narrowing of carotid where it leaves the foramen (double arrows). This was confirmed on several films.

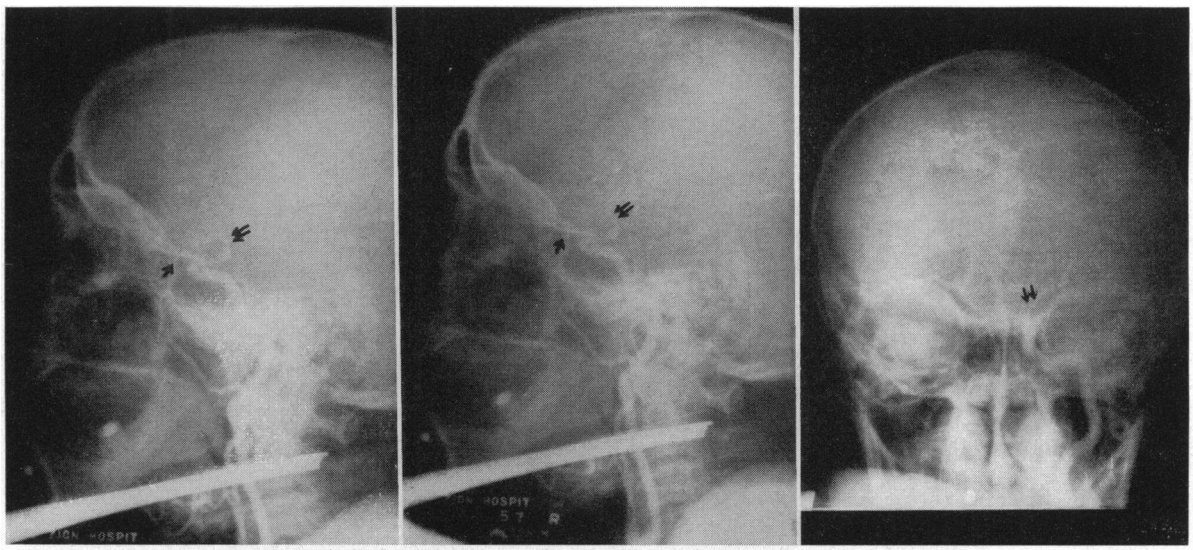

Figure 2 (Case 2).—*Left:* Lateral projection three seconds after the start of injection. *Center and right:* Lateral and anteroposterior projections six seconds after the start of injection. Note the consistent block of the left internal carotid artery at the siphon (double arrows). The ophthalmic artery is slightly dilated as a result of collateral circulation through it (single arrow).

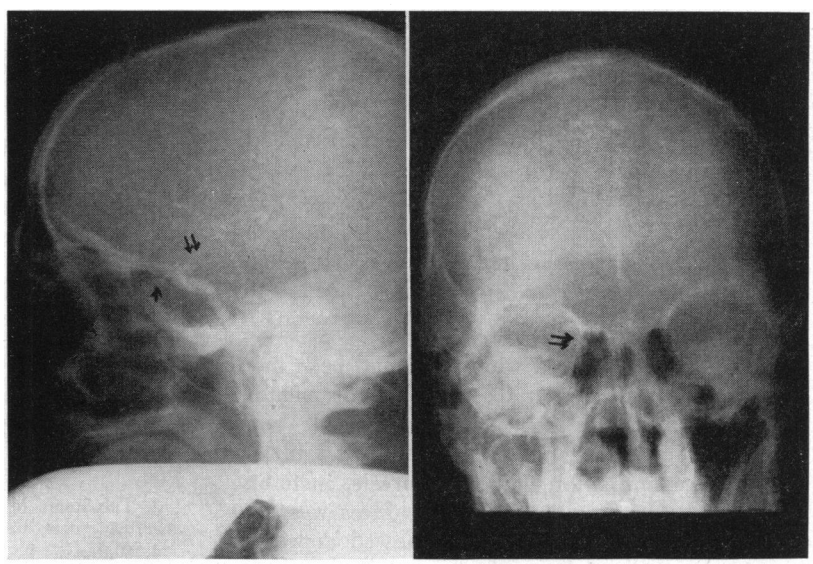

Figure 3 (Case 3).—Lateral and anteroposterior projections four seconds after the start of injection. A block of the right internal carotid artery in the siphon is shown (double arrows). This was confirmed on multiple films. The ophthalmic artery is demonstrated (single arrow).

The diagnosis of vascular occlusion or narrowing must hinge upon the repeated demonstration of lack of filling of the branch vessels. The following cases illustrate the use of the serial biplane exposures suggested above.

CASE 1. A 45-year-old white man had noticed muscular weakness starting about a year previously in the left biceps and spreading gradually to the forearm and hand. All neurological signs were on the left: facial weakness, weak upper arm (upper motor neurone) and weak dorsiflexion of the foot, together with diminished sensation in the hand (judged to be cortical) and general hyperthesia and hypalgesia on that side.

Cerebral angiography (Figure 1) showed in the first film a narrowing in the carotid artery which later filled out. In the second film a block in the right carotid siphon was seen. If only the first film had been taken this block would have been missed and diagnosis based on the first false impression.

CASE 2. The patient was a 58-year-old white man who was admitted to hospital because of papilledema of two weeks' duration. Five years previously he had had a cerebrovascular accident with right hemiparesis but had completely recovered. In the previous three months he had had sensory changes of the right side of the body, and a right homonymous field defect developed. He had trouble finding cer-

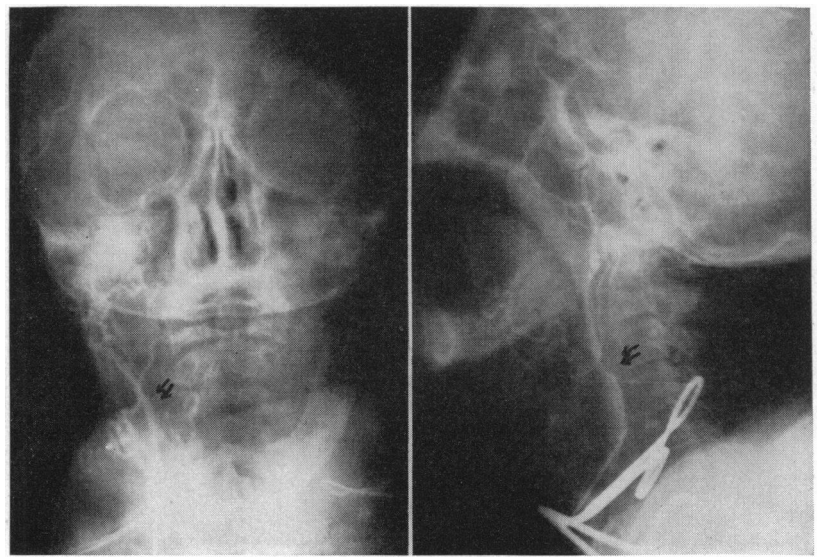

Figure 4 (Case 4).—Anteroposterior and lateral projections two seconds after the start of injection. There is a complete occlusion of the internal carotid artery just beyond the branching of the common carotid (double arrows).

tain words and had severe frontal headaches. The papilledema was demonstrated during examination.

Sensation was diminished to touch and pinprick over the whole right half of the body. There was slight right facial weakness and difficulty in convergence. Decided aphasia, motor and sensory, for both writing and speech was noted. The blood pressure was within normal limits. An electroencephalogram showed focal disturbance in the left temporoparieto-occipital region.

Cerebral angiography (Figure 2) demonstrated a consistent block of the left carotid siphon. Some collateral circulation was demonstrated through the ophthalmic artery.

CASE 3. A 78-year-old white man had been mentally confused for a month, with loss of memory and impairment of sight and hearing. He complained of increasing weakness of the left arm and leg. Upon examination, left hemiparesis, including facial weakness, was noted. The deafness was conductive, old. An encephalogram showed depressed function over the right cerebrum.

Cerebral angiography (Figure 3) showed a block of the right common carotid artery in the siphon. The ophthalmic artery was demonstrated.

CASE 4. The patient was a 70-year-old white man who suddenly became comatose and disoriented. Upon physical examination, left hemiparesis was noted.

Cerebral angiography (Figure 4) demonstrated occlusion of the right internal carotid artery just beyond the bifurcation of the common carotid artery. Endarterectomy was done, with moderate improvement.

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REFERENCES

1. Livingston, K., Escobar, A., and Nichols, G. D.: Hemiplegia caused by cerebrovascular thrombosis; an arteriographic study, J. Neurosurgery, 12:336-344, July 1955.

2. Moniz, E.: L'Angiographic Cerebrale, Masson, Paris, 1934.

3. Tabelman, M.: The angiographic evaluation of cerebral atherosclerosis, Radiology, 70:801-810, June 1958.

4. Webster, J. E., Gurdian, E. S., and Martin, F. A.: Carotid artery occlusion, Neurology, 6:491-502, July 1956.